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ABSTRACT

Gender, racial, and ethnic differences occur in vocational and cognitive ability assessments when the average scores of various groups are not equal. Results of such assessments indicate that not all groups are equally represented at all points of the assessment continuum. Many attempts to reduce or minimize existing group differences have been unsuccessful, and current research has failed to account fully for the sources of these differences. This chapter provides a summary of group differences on vocational assessments. The information is intended to provide a broad understanding of the core issues in the assessment process and provide accurate information concerning the magnitude of existing group differences. (Contains 37 references and a table.) (Author)

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Chapter 8
Racial and Ethnic Difference in Performance

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Gender, racial, and ethnic differences occur in vocational and cognitive ability assessments when the average scores of various groups are not equal. Results of such assessments indicate that not all groups are equally represented at all points of the assessment continuum. Many attempts to reduce or minimize existing group differences have been unsuccessful, and current research has failed to account fully for the sources of these differences. This chapter provides a summary of group differences on vocational assessments. The information is intended to provide a broad understanding of the core issues in the assessment process and provide accurate information concerning the magnitude of existing group differences.

Goals of Assessment

The goals of assessment in career guidance and counseling are to provide information that objectively describes a client's interests, characteristics, and abilities. Assessment is a systematic procedure for observing behavior and describing it using empirical data. This understanding provides reliable information about vocational interests and abilities that is useful for identifying educational opportunities. Such assessments are especially useful for understanding how one's interests and skills fit with available career choices.

Assessments allow counselors to learn much about their clients in a short amount of time. Assessments describe current functioning, and confirm, refute, or modify the hypotheses a counselor has formed through less structured exchanges with clients, thereby allowing for the systematic identification of therapeutic needs and necessary guidance (Meyer et al., 2001). The counselor can then use the results to help clients become more self-aware of their personal characteristics. Counselors often use assessments when a client's introspection has

not led to specific answers to his or her vocational or ability dilemmas. Individuals taking assessments use the results to identify their strengths so that they may take advantage of opportunities in school and in the workforce. An understanding of their weaknesses can also lead to the type of personal development that will allow clients to develop the skills needed to reach their goals. The benefits of using assessments as a tool for identifying individual strengths and weaknesses have been well researched. In addition, these assessments compare in validity and accuracy to assessments used in the medical profession (Meyer et al., 2001).

Types of Assessment Measures

Although assessments are a valued part of counseling, counselors need to have a basic understanding of different types of assessments and the basic skills needed to properly interpret the data. In addition to these basic requirements, they should also know the limitations of tests and understand the history of testing. This knowledge would include a basic understanding of the types of tests available.

Vocational Interest Assessments

Vocational interest assessments are useful in helping clients understand their occupational interests. Assessments in this area include the Strong Interest Inventory, the Career Assessment Inventory, the Kuder Occupational Interest Survey, and the Self-Directed Search (SDS). Vocational interest assessments aid individuals in developing a systematic way of thinking about their interests and how they relate to the working world. An individual's vocational interest can be summarized with reference to six vocational career interest types: Realistic, Investigative, Conventional, Artistic, Enterprising, and Social. Our discussion of gender and racial differences in vocational interest measures will focus on these six vocational interest types because they are reported in most interest inventories.

Realistic people tend to prefer working with their hands or with tools, and they prefer limited social interaction. Often they work outdoors. Their jobs include automobile mechanic, farmer, and electrician. *Investigative* individuals tend to be most comfortable solving problems. Science, math, and research professions are prevalent among these people. Typical investigative occupations include chemist, engineer, and medical technician. *Conventional* individuals tend to be interested in occupations involving bookkeeping and computation.

They prefer tasks requiring an attention to detail, and of the vocational interest types, they are the least interested in artistic tasks. *Artistic* individuals openly seek opportunities to use their talents in art, music, and literature. Typical occupations include photographer, musician, or poet. *Enterprising* individuals are leaders and prefer to be in positions of power. Skills include management and communication, particularly public speaking. Typical careers are financial manager or hotel manager. *Social* individuals desire interaction with others. They have strong preferences for helping others, particularly through teaching. They have careers such as psychologist, counselor, teacher, or occupational therapist (Defense Manpower Data Center,1992).

Cognitive Ability Assessments

Spearman (1927) argued that a single general factor was highly correlated with a variety of cognitive ability tests containing many different kinds of categories (such as verbal, mathematical, and reasoning). Several theories suggest that there are additional specific abilities, such as fluid ability, crystallized ability, and memory ability (Carroll, 1993). Jensen (1980) found that a general aptitude test (such as the SAT), designed to measure how much knowledge a student has acquired, is highly correlated with learning ability and general cognitive ability. Cognitive ability and aptitude tests predict future intellectual achievements. This idea is supported by data showing that academic achievement tests, such as the ACT, GRE, SAT, and MCAT, strongly correlate with most cognitive ability assessments (Neisser et al., 1996).

Group differences in general cognitive ability assessments provide the greatest challenge for counseling applications. These tests are often used in selection for college and job placement; therefore, group differences result in differences in selection rates across groups. Tests designed to measure general cognitive ability show larger differences among races than do tests designed to measure verbal and mathematical ability. This is due to the less than perfect correlation between achievement and general cognitive ability assessments (Roth, Bevier, Bobko, Switzer, & Tyler, 2001).

What Are Group Differences?

You may wonder what procedure is used to determine if test bias or group differences account for the difference in assessment scores. Assessments focusing on cognitive ability and vocational interest were not intended to obtain group differences. Rather, they were

constructed to measure abilities or preferences. Obtaining different mean scores from two different groups on the same assessment by itself will not constitute a biased measurement. Group differences typically reflect true differences in ability or preference. The presence of test bias and magnitude of bias is most accurately determined using statistical tools. The following section describes how group differences are identified and the implications of these differences.

Score Differences

Research on test score differences generally begins with comparisons of group performance. A group consists of individuals with similar physical characteristics (such as age, race, or gender). Their performance as a group on a test is represented by the group's mean score. The standard deviation measures the dispersion of scores around the mean. If everyone gets nearly the same test score, and the scores are clustered tightly around the mean, then the standard deviation is small. If the scores vary widely, and are widely dispersed around the mean, then the standard deviation is large. Group differences are summarized by calculating a *d* statistic that expresses the difference between the groups in standard deviation units. A *d* of 0 indicates no difference between two groups. A *d* of 1 indicates one standard deviation difference between the groups.

Assessments used by education professionals often show mean score differences in vocational assessment measures between minorities and non-minorities and between males and females. The persistent question remains whether these differences are illusionary due to some problem or bias in the assessment tool, or whether the differences are real.

Test Bias

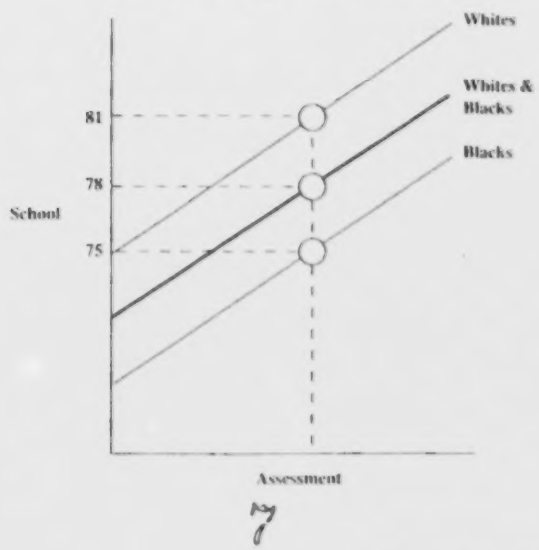
It is possible to create an assessment in which the content is biased for some individuals and not for others (Williams, 1972). Bias in terms of assessments has often concentrated on the content validity and whether the items are representative of content that is universally understood. An achievement test would be biased only if it resulted in a lower or higher mean for the group due to inclusion or exclusion of items with content appropriate only to particular segments of the test-taking population. However, professionally developed assessments used in career guidance and counseling are largely absent

of these types of biases.

Prediction bias refers to differences in the predictive accuracy of a test. For example, research shows that cognitive ability tends to predict school and work performance (Jensen, 1980; Neisser et al., 1996). Therefore, if tests were biased against African Americans, they would underpredict performance of African Americans relative to Whites. This has not been found to be the case, and it is clear that assessments are not biased against African Americans (Neisser et al., 1996). Therefore assessments can, and often do, show group differences but are not biased. The group differences reflect true differences among groups in the abilities or interests being assessed.

An example of a statistical evaluation of test bias is shown in Figure 1. The bold (center) line in the figure is the common regression line for both Blacks and Whites. One can use this common regression line to make predictions concerning performance (in this example, school performance). When Blacks, on average, score lower than Whites on the variable to be predicted, the common regression line will overpredict the performance of Blacks and underpredict the performance of Whites. This prediction bias is due to the mean score differences in the variable being predicted. To predict performance more accurately, one could use separate regression lines for Blacks and Whites. In Figure 1, the separate regression lines have the same slope. This is evidence that the test is not biased. The situation presented in Figure 1 is typical for those performance domains that show mean differences where Blacks, on average, perform worse than Whites. These domains would include school performance (Roth & Bobko, 2000) and job performance (DuBois, Sackett, Zedeck, & Fogli, 1993; Sackett & DuBois, 1991).

Figure 1. Example of a Prediction Bias Analysis



Interest Assessments and Gender

Mean differences between males and females have been found consistently in inventories based on Holland's RIASEC theory. Data from the Holland (1985) SDS manual inventories show that females score substantially higher than males on the Social theme ($d = 1.1$) and moderately higher on Artistic ($d = 0.60$) and Conventional ($d = 0.58$); males tend to have dramatically higher scores on the Realistic ($d = 1.79$) and moderately higher scores on the Investigative ($d = 0.41$) themes.[1] The gender differences found with the SDS are also found for the RIASEC scales from the Strong Interest Inventory (Fouad, Harmon, & Borgen, 1997; Harmon, Hansen, & Hammer, 1994),[2] although they are of a smaller magnitude (R = 0.70, I = 0.20, A = 0.54, C = 0.12, S = 0.26). These gender differences are consistent with the decreased likelihood that females will explore occupations in the skilled trades, medicine, science, engineering, or law and an increased likelihood that males will not explore occupations such as teaching or office assistance. Other interesting gender differences show that women working in traditionally male occupations scored higher in Investigative and women in traditionally female occupations scored higher on the Social scale (Godin, 1975; Rezler, 1967, cited in Holland, 1985).

It is likely that these gender differences have been shaped largely by the social role expectations of men and women. Changes in these expectations may result in a redistribution of these gender score differences, but as of now these differences remain stable. Because men and women show different score distributions in most interest areas, interest measures have often been charged with being biased. Unlike cognitive ability tests in which the causes of mean differences are subject to continual debate, most research shows that gender mean differences on vocational interest tests are strongly related to role expectations of the culture. However, interests also have a moderate genetic basis (Lykken, Bouchard, McGue, & Tellegen, 1993), and whether the differences between men and women are at least in part genetically based is a topic for future research.

Interest Assessments and Race

Unlike the case of gender differences in vocational interest measures, there is little research on racial differences. However, the technical guide to the Strong Interest Inventory has identified differences by gender, race, and ethnicity for the RIASEC scales. For a complete

listing of these differences, see Table 1. Here we discuss differences of *d* greater than or equal to 0.20 (thereby eliminating Hispanics from the discussion). African American males score higher than White males in Social, Enterprising, and Conventional dimensions (*d* = 0.43, 0.29, 0.32, respectively), and White males score higher on Realistic interests (*d* = 0.24). White females score higher than African American females on Realistic and Investigative (*d* = 0.27, 0.26), whereas African American females score higher on Social and Enterprising interests (*d* = 0.33, 0.26). White males outscore Native American males on the Investigative measure (*d* = 0.22), but Asian American males score higher than White males (*d* = 0.35). White females score higher than Native American females on Investigative (*d* = 0.27), and Asian American females score higher than White females on Investigative and Realistic interests (*d* = 0.32, 0.20) (Fouad et al., 1997; Harmon et al., 1994). Other evidence has confirmed the finding that African Americans and Whites differed on Social scores, with African Americans being higher, and Whites scoring higher on Realistic and Investigative (Kaufman, Ford-Richards, & McLean, 1998; Kimball, Sedlacek, & Brooks, 1973).

Table 1. Racial and Ethnic Occupational Interest Comparison by Standard Deviation

Compared Groups		Realistic	Investigative	Artistic	Social	Enterprising	Conventional
White females	Hispanic American females	-.13	-.13	.19	.02	.02	-.15
White females	Asian American females	.20	.32	.13	-.08	.18	.13
White females	Native American females	-.02	-.27	-.40	-.10	-.12	.3
White females	African American females	-.27	-.26	-.07	.33	.26	.17
White males	Hispanic American males	-.06	-.06	.19	.13	.05	.021
White males	Asian American males	0.00	.35	.19	.15	.16	.17
White males	Native American males	.02	-.22	-.11	.16	.17	.02
White males	African American males	-.24	-.10	.13	.43	.29	.32

We calculated these d statistics based on data presented in Table 15.4 in Fouad et al. (1997) and data in Harmon et al. (1994). Positive values indicate that people of color score higher than Whites. Negative values indicate that Whites score higher than people of color.

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Some researchers believe that people of different races hold their own distinct values, thereby requiring race-specific vocational interest tests. Day and Rounds (1998) conducted a review of this research and found that the basic structure of vocational interest is invariant across racial groups (African Americans, Hispanic Americans, Asian Americans, Native Americans, and Whites). In addition, counselors and school psychologists continue to indicate that it is plausible that African Americans' interests might reflect economic constraints that might not be present for economically stable youth. Occupations selected by African Americans allow for greater expression of social and interpersonal influence, and are less dependent on higher educational or intellectual attainment than are traditional occupations (Kaufman et al., 1998).

Interest Assessments and Sexual Orientation

Research has also focused on determining if differences exist between heterosexuals and homosexuals in the career selection process. The environmental and personal factors relating to being a member of a minority group may create different decision-making processes. These altered processes potentially create differences in the types of career selections made by homosexuals. A study by Chung and Harmon (1994) provided evidence that such differences are present. This study found that homosexual males' career interests were atypical compared to careers identified as traditional male preferences. Homosexual men scored lower on the Realistic and Investigative scales, and higher on the Artistic and Social scales. The research in this area is still ongoing, and researchers are attempting to reach a consensus on the impact of homosexuality and the development of personality.

Cognitive Ability Assessments

Cognitive ability has multiple definitions with largely similar connotations to the layperson's conception of cognitive ability as mental power—the ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, and to take part in mental reasoning (Neisser et al., 1996). Cognitive ability "is a general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely 'book learning,' a narrow academic skill, or test-taking smarts. Rather, it reflects a broader

and deeper capability for comprehending —'catching on' 'making sense' of things, or 'figuring out what to do'" (Mainstream Science on Intelligence, 1994).

Properties of Cognitive Ability Assessments

Cognitive ability assessments measure constructs on a continuum of high and low scores. With enough data, a normal distribution is found in which the vast majority of scores are near the midpoint of the range. For historical reasons, the term *IQ* (intelligence quotient) is often used to describe scores on tests of cognitive ability (Neisser et al., 1996).

Individuals rarely perform equally well on all items included in a test of cognitive ability. One person may do better on verbal than on spatial items, whereas another person may score equally well on both kinds of items. However, individuals scoring above average on a measure of verbal ability in one cognitive ability test likely will be above average on verbal ability on a different cognitive ability measure as well.

Group Differences in Cognitive Ability

The study of group differences in cognitive ability typically shows that within-race variance is greater than between-race variance. The same is true of gender-group variance. This broad variance places members of every race and gender at every intellectual level, thereby making stereotyping of individuals based on group membership inappropriate. If general mental ability is normally distributed, the practical amount of variance within a racial or ethnic group is approximately six to eight standard deviations. This strongly supports the notion that there are exceptionally intelligent individuals from all racial and ethnic groups (Roth et al., 2001).

Gender Differences in Cognitive Ability

Research shows that on most standard tests of intelligence, there are no overall group score differences between females and males. Cognitive ability differences between the sexes have been reported; however, the direction of the correlation is variable and the effect sizes are small (Held, Alderton, Foley, & Segall, 1993; Lynn, 1994). Differences favoring males do appear on visual-spatial tasks, such as mental rotation and spatiotemporal tasks (Neisser et al., 1996; Maters & Sanders, 1993).

Adolescent females in grade school perform better on quantitative tasks than do their male counterparts (Hyde, Fennema, & Lamon, 1990).

These differences reverse prior to puberty, and males maintain a higher performance level on quantitative tasks throughout the remaining age categories. Strong evidence of this advantage can be found in the math section of the SAT, where many more males score in the highest ranges (Benbow, 1988; Halpern, 1992). The male advantage is between d = 0.33 and d = 0.50. Females tend to score higher on verbal tasks, and their advantage tends to range from d = 0.5 to 1.2. Data on college achievement tests indicate that females score higher in literature, English composition, and Spanish (Neisser et al., 1996; Stanley, 1993). In measures of general mental ability, gender differences are of a very small magnitude. On more specific cognitive abilities, some differences do appear and do represent true score differences between the sexes.

Racial Differences in Cognitive Ability

African Americans. The effect size for cognitive ability measures used in industrial and educational settings records the differences between Whites and Blacks at one standard deviation, with African Americans tending to score one standard deviation below Whites (Jensen, 1980; Neisser et al., 1996; Roth et al., 2001). The difference is largest on those tests that best represent a general cognitive ability factor (Jensen, 1985).

Hispanic Americans. In the United States, the mean cognitive ability scores of Hispanics typically lie between those of Blacks and Whites. Roth et al. (2001) reported Hispanics to have lower cognitive ability scores than Whites had (d = 0.72). The diverse cultural and ethnic divisions of the Hispanic group—which includes Mexican Americans, Puerto Ricans, Central and South Americans, and Cubans—along with linguistic factors may play an important role in these score differences. For Hispanic American high school students with moderate to high English proficiency, standard aptitude tests predicted first-year college grades to be equal to those of non-Hispanic Whites (Pennock-Roman, 1992).

Native Americans. Too little research in this area has been conducted to determine if group differences truly exist. Native Americans as a group speak upwards of 200 different languages and often live on reservations, which are only a couple of the major cultural and ethnic differences making it difficult to identify Native Americans as a single group (Leap, 1981; Neisser et al., 1996). Neisser et al. (1996) presented some information indicating that Inuit and other groups living in Arctic

regions tend to have high visual-spatial skills, which do not diverge by gender. In addition, Native American children tend to obtain relatively low scores on tests of verbal intelligence. This information has led to the contention that Native Americans as a group tend to score lower on verbal scales compared to performance scales (Neisser et al., 1996).

Asian Americans. General agreement on the performance of Asian American groups has not been reached. It does seem that Asian Americans perform better than Whites in school achievement and occupational success. It is often perceived that these achievements reflect correspondingly high intelligence test scores; evidence has not yet proved this correlation. Studies have reported Asian Americans to have scores ranging from no difference to $d = 0.75$ above Whites in measures of cognitive ability (Flynn, 1991; Lynn, 1993).

Racial Issues and Cognitive Ability

Controlled studies have shown that racial group differences in cognitive ability scores are not attributable to the characteristics of the tests (Helms, 1992; Jensen, 1980). Efforts to create reliable and valid assessments of cognitive ability that would eliminate or reduce racial and ethnic group differences have been ineffective (Neisser et al., 1996). The study of Whites and African Americans has had far more prominence in research than the comparison of other groups (Roth et al., 2001). It is clear that mean differences between African Americans and Whites reflect large and real group differences in cognitive ability. (Chapter 10 addresses socioeconomic and cultural factors that interfere with good test performance.)

Ethical Issues in Assessment

The role of educator is continually becoming more complicated, and the reliance upon assessment tools is growing beyond the field of education. Assessments are popular because they are standardized to a quality level equal in most environments, thereby guaranteeing that students anywhere using the same assessment will receive similar career advisement. Similarly, counselors and administrators will be able to make some universal judgments based on assessment scores for most students from most backgrounds. It is important to remember that assessments are psychological in nature, and their misuse can have damaging outcomes for students. Even the simple use of test scores for educational development (not including student selection for advanced

programs) can have an impact on the students. Students may use their assessment profiles as predictors of their potential for success, resulting in their self-selection to specific programs and prematurely and incorrectly biasing them to specific success levels or professional possibilities without a full understanding of the meaning behind the results.

Teachers will have added administrative duties for providing adequate interpretation of each assessment's theory, assumptions, and the implications resulting from its use. Interpretation has been complicated by the debates concerning the meaning of group differences in cognitive ability and vocational interest assessments. Therefore, opinions formed by students, administrators, community members, and parents about these assessments will require teachers to have technical knowledge for formal and informal discussions with students, parents, and administrators. This information is complex because it must be translated into real-world settings with real implications for students. As a result, teachers have an ethical responsibility to provide precise and complete information about assessments and their meaning.

Teachers who administer assessments need to treat assessment information with sensitivity. Evidence can be found to indicate how college selection practices relying heavily on measures of academic potential result in lost talent. Universities that would select only the high school students with the top grades, for example, would exclude about 86 percent of high school class presidents. Selecting only *A* students results in the exclusion of about 95 percent of national science award winners (Gottfredson, 1999). The true value and goal of assessment is to provide students with information about themselves. Psychometricians are still unable to predict without error the future performance of all individuals or groups based upon assessment scores. The treatment of individuals and groups based solely on their scores is unethical. Misuse of data and technical ineptness are not valid excuses.

Conclusion

This chapter has provided an overview of racial, ethnic, and gender group differences on traditional interest inventories and cognitive ability assessments. Results show that African Americans tend to obtain slightly higher Social scores than do Whites, who tend to score slightly higher on Realistic and Investigative dimensions. Research on the SDS inventory shows that females score substantially higher on the Social, and somewhat higher on the Artistic and Conventional themes than do

males, but males tend to have dramatically higher scores on the Realistic and somewhat higher scores on the Investigative themes (Holland, 1985).

Studies of racial and ethnic differences on cognitive ability tests have predominantly focused on differences between African Americans and Whites. Research indicates that cognitive ability assessments show a one standard deviation difference that favors Whites over African Americans. On average, Hispanics' scores are higher than African Americans' scores, but lower than Whites' scores. Scores of Asian Americans and Whites have not shown large differences, but Asian Americans' scores tend to be slightly higher. Gender differences in cognitive ability favor males on visual-spatial tasks, such as mental rotation and spatiotemporal tasks, such as tracking a moving object through space. Females have a clear advantage on quantitative tasks in the early years of school, but these differences reverse prior to puberty, and males score higher on such tasks throughout the remaining age categories. Males also have an advantage in math achievement tests, and females have an advantage in verbal tasks, enabling them to score higher in English and vocabulary.

Assessments used in educational or clinical environments are not typically designed to be the sole information source used to evaluate a particular client's needs. Group score differences are an interesting phenomenon that results from the unique social and biological environments people live in and should not affect the high level of respect due to all racial, ethnic, and gender groups. It should be noted that differences within a group are more numerous and varied than differences across groups. Therefore, we cannot use group data to make definitive statements or predictions about how a particular individual will perform on particular measures. Future research will likely provide more thorough explanations of the environmental and genetic determinants of group differences.

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Notes

1. We calculated these *d* statistics based on data presented in Table B1 in Holland (1985).

2. We calculated these *d* statistics based on data presented in Table 15.4 in Fouad et al. (1997) and data in Harmon et al. (1994).

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